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Willingness to Accept Trade-Offs Among COVID-19 Cases, Social-Distancing Restrictions, and Economic Impact: A Nationwide US Study

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ABSTRACT

Objective: To conduct a discrete-choice experiment to quantify Americans' acceptance of severe acute respiratory syndrome coronavirus 2 infection risks for earlier lifting of social-distancing restrictions and diminishing the pandemic's economic impact.

Methods: We designed a discrete-choice experiment to administer 10 choice questions to each respondent representing experimentally controlled pairs of scenarios defined by when nonessential businesses could reopen (May, July, or October 2020), cumulative percentage of Americans contracting coronavirus disease 2019 (COVID-19) through 2020 (2% to 20%), time for economic recovery (2 to 5 years), and the percentage of US households falling below the poverty threshold (16% to 25%). Respondents were recruited by SurveyHealthcareGlobus.

Results: A total of 5953 adults across all 50 states completed the survey between May 8 and 20, 2020. Latent-class analysis supported a 4-class model. The largest class (36%) represented COVID-19 *risk-minimizers*, reluctant to accept any increases in COVID-19 risks. About 26% were *waiters*, strongly preferring to delay reopening nonessential businesses, independent of COVID-19 risk levels. Another 25% represented *recovery-supporters*, primarily concerned about time required for economic recovery. This group would accept COVID-19 risks as high as 16% (95% CI: 13%-19%) to shorten economic recovery from 3 to 2 years. The final *openers* class prioritized lifting social distancing restrictions, accepting of COVID-19 risks greater than 20% to open in May rather than July or October. Political affiliation, race, household income, and employment status were all associated with class membership ($P<.01$).

Conclusion: Americans have diverse preferences pertaining to social-distancing restrictions, infection risks, and economic outcomes. These findings can assist elected and public-health officials in making difficult policy decisions related to the pandemic.

Keywords: COVID-19, discrete-choice experiment, social-distancing restrictions, stated preference.

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Introduction

Economic damages stemming from restrictions designed to combat the spread of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) have had widespread impacts on business, government, and household budgets. Despite models predicting increases in coronavirus disease 2019 (COVID-19) infections as restrictions are lifted and risks of local spikes in cases, governors across the United States are experimenting with phased restarting of economic activity. These decisions require explicit judgments about the relative importance of the risks associated with COVID-19 cases and the economic toll of social-distancing restrictions with downstream effects on non–COVID-19 health outcomes, social instability, poverty, and provision of public services such as education and law enforcement.

Although the preferences of a few are clearly exhibited in protests at state capitals and others remain isolated in their homes, decision makers lack information from studies designed to systematically evaluate the public's views on the trade-offs between COVID-19 management policies and their economic impact. Public-opinion surveys indicating general support for or opposition to social distancing do not provide information on the value judgments required to evaluate the timing and scale of lifting restrictions. Rigorous quantification of the public's acceptance of these tradeoffs could provide valuable information to government and public health officials during the initial phase of the pandemic as well as in response to subsequent spikes in infections. Lifting restrictions may not immediately induce risk-averse people to reengage in economic activities. Nevertheless, identifying the sizes of groups with distinctive preferences for public health versus economic tradeoffs also could help decision makers weigh the relative importance of the expected health and non-health outcomes of various policies.

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Stated-preference surveys for policy decision making have a long history in economics, including transportation,[1] environmental,[2,3] and health.[4-6] Trade-off measures obtained with discrete-choice experiments (DCEs) have been endorsed by several government agencies in the United States, including the Environmental Protection Agency, the Centers for Disease Control and Prevention, and the Food and Drug Administration as a way to collect evidence in support of their policy-making roles.

Methods

We designed a DCE to determine the extent to which Americans are willing to accept greater spread of SARS-CoV-2 to lift social-distancing restrictions and limit the economic impact of the pandemic. We hypothesized that preferences would differ by sex, age, education, political affiliation, household income, and employment status.

Survey Development

The DCE focused on 4 factors: COVID-19 risk, the duration of social-distancing restrictions, and the depth and duration of negative economic impacts. COVID-19 risk was described as the percentage of the US population infected with the virus through the end of 2020 accounting for all cases, confirmed and unconfirmed. Levels ranged from 2% to 20%, based on an estimated 1.4 million diagnosed cases on May 14, 2020 in the United States, increased by factors of approximately 5 to 50 to account for undiagnosed cases and potential increases through 2020.[7]

We asked respondents to consider the duration of restrictions on such nonessential businesses as hair salons, fitness clubs, and retail stores. For this factor, respondents were told when restrictions for these businesses would be lifted with levels ranging from "now" (May 2020) to "October" representing a duration of 5 additional months. The depth of the economic toll was portrayed as an increase in the percentage of US households falling below the poverty threshold, from 13%, the national average in 2018.[8] Three levels included increases to 16%, 20%, and 25%. The fourth factor representing the duration of economic impact was described as the number of years before the economy would recover to "pre-COVID-19 levels," with 2-year, 3-year, and 5-year levels.[9] An example choice question is provided in the supplemental materials (see Supplemental Materials found at https://doi.org/10.1016/j.jval.2020.07.003).

To provide context about the relative importance of different types of social-distancing restrictions, the survey also included a ranking exercise in which respondents were asked to rank the importance of lifting 6 groups of restrictions: (1) reopening nonessential businesses, (2) allowing dine-in meals in restaurants, (3) reopening schools and colleges, (4) allowing sporting events to resume, (5) allowing religious ceremonies to resume, and (6) reopening parks and museums. Additional survey items were included to collect sociodemographic characteristics, 3-digit ZIP code, health conditions, and other information possibly related to respondents' preferences.

We used Lighthouse Studio version 9.8 (Sawtooth Software, Orem, UT) to program the web-based survey. Factor levels shown across choice questions were governed by an orthogonal experimental design with 300 versions of 10 pairs of hypothetical scenarios. Each respondent was assigned to 1 of the 300 versions and answered 10 choice questions. To field the survey, we collaborated with SurveyHealthcareGlobus, a healthcare market-research firm. SurveyHealthcareGlobus sent emails to adults across the United States inviting them to complete the survey, with oversampling in New York, California, Florida, Texas, and North Carolina.

The study protocol was reviewed and determined to be exempt by the Duke Health Institutional Review Board (Pro00105431). There was no external funding for the study.

Analysis

Given the wide range of views expressed in the lay press and social media outlets, our statistical modeling approach focused on exploring and characterizing heterogeneity in preferences across respondents. We used conditional-logit latent-class analysis to identify groups of respondents with similar choice patterns. In preliminary models, categorical models indicated that COVID-19 risk levels were linearly associated with the log-odds of chosen alternatives. Subsequently, the COVID-19 regression parameter was modeled as a linear, continuous covariate. The relative importance of other factors is reported as the increases in COVID-19 risk levels that were perceived to the have the same importance as changes in duration of nonessential business closures, increases in the percentage of households below the poverty line, and longer durations of a COVID-related economic downturn. In these calculations, we divided the differences in attribute-level preference weights by the COVID-19 slope, the marginal utility of a 1 percentage-point change in risk. This risk metric is directly analogous to willingness-to-pay calculations in choice-experiment studies that include a cost factor.[10] To test whether sex, age, education, political affiliation, household income, and employment status were associated with membership in different preference groups, we incorporated respondent-level characteristics to the latent-class models as covariates. We used Stata/SE 16.1 (StataCorp LLC, College Station, TX) and LatentGOLD 5.1 (Statistical Innovations Inc, Belmont, MA) software for analysis.

Results

A total of 5953 respondents completed the survey between May 8 and May 20, 2020. Respondents were generally representative of the adult US population. Table 1 provides descriptive statistics for our study cohort in relation to the US adult population. Our sample matched the national age distribution, but overrepresented female and white respondents, and respondents with more formal education than the general population. Nevertheless, our study cohort had large numbers of respondents of varying ages and income levels with wide geographic dispersion representing all 50 states. Approximately 4 in 10 identified as Democrat, 3 in 10 as Republican, and nearly 3 in 10 as independent political affiliation.

Respondents answered a simple ranking question on the relative importance of reopening various activities. On average, respondents considered reopening nonessential businesses to be the most important (mean ranking 2.3, with 1 being most important) with 37% ranking it as the most important policy. Reopening schools and colleges was second most important (mean, 3.2), followed by allowing dine-in meals in restaurants (mean, 3.5), reopening parks and museums (mean, 3.5), allowing religious services to resume (mean, 3.7), and allowing sporting events to resume (mean, 4.8). All pairwise differences were statistically significant ($P<.0001$) with the exception of restaurants versus parks/museums.

Model-fit statistics indicated that a 4-class model provided good data fit with relatively large segments of the sample distributed across all 4 classes. Figure 1 shows variations in the relative importance of the 4 factors used to portray alternative scenarios. Class 1 represented approximately 36% of respondents who predominantly selected scenarios with the lower cumulative incidence of COVID-19. For ease of exposition, we refer to this

Table 1. Characteristics for US adult population and survey respondents.

	US adult population (%)	Survey respondents N = 5953 (%)
Female	52*	67
Age, mean	47 years*	48 years
18-44	46	45
45-64	33	35
65 years and older	21	20
Race		
White	63†	77
African American	12	8
Hispanic or Latino	16	6
Asian	6	5
Other‡	3	3
Education		
High school or less	39§	20
Some college	18	20
Associate's degree	10	17‖
Bachelor's degree	21	26
Graduate degree	12	18
Household income		
<$25 000	17*	18#
$25 000 to $49 999	21	25
$50 000 to $99 999	29	35
$100 000 or more	32	22
Geographic region		
Northeast	18*	21
Midwest	21	23
South	38	37
West	24	19
Political affiliation		
Democrat	31#	40¶
Independent	36	29
Republican	30	32

*US Census Bureau, Current Population Survey, Annual Social and Economic Supplement, 2018.
†Adult population by race in 2018. From National KIDS COUNT. Population Division, US Census Bureau.
‡Includes American Indian, Alaskan native, native Hawaiian, other Pacific Islander, and mixed race.
§U.S. Census Bureau, Current Population Survey, Annual Social and Economic Supplement, 2019. https://datacenter.kidscount.org/data/tables/6539-adult-population-by-race#detailed/1/any/false/37/68,69,67,12,70,66,71,2800/13517,13518.
‖Associate's degree and technical college combined.
¶Excludes from the denominator 5% of respondents who "did not know" or "prefer not to say."
#Gallup. Party Affiliation. April 14-28, 2020. https://news.gallup.com/poll/15370/party-affiliation.aspx.

group as *risk-minimizers*. Class 2 and class 3 were similarly sized, with approximately 26% and 25% of the sample in these groups, respectively. Class 2 was the only group that preferred delaying the reopening of nonessential businesses until October, independent of COVID-19 risks, and they gave more weight to the poverty factor. Respondents in class 3 prioritized scenarios depicting faster economic recovery; they placed little importance on when nonessential businesses would be reopened. For this class, reducing the time required for economic recovery from 5 years to 2 years was about twice as important as reducing the cumulative risk of COVID-19 cases through 2020 increasing from 2% to 20%. For ease of exposition, we refer to class 2 as *waiters* and class 3 as *recovery-supporters*. Class 4 represented about 13% of respondents who strongly prefer reopening nonessential businesses now. Hence, we refer to this class as *openers*.

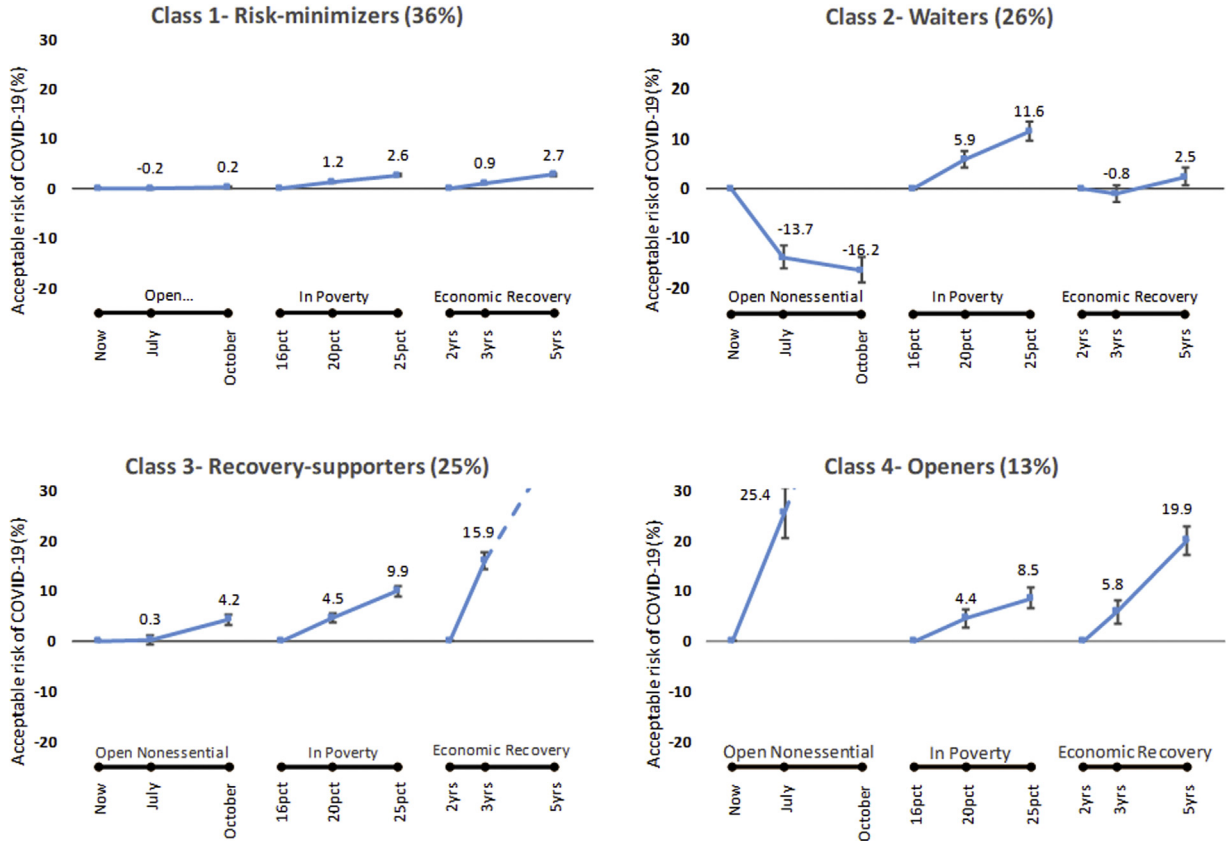
Figure 1. Relative importance of discrete-choice experiment factors. Relative importance weights for each class sum to 100. Larger weights represent greater importance to members of each class, conditional on the range of levels shown for each factor. Note: Relative importance weights for reopening nonessential businesses for classes 1, 3, and 4 represent preferences for earlier reopening. For class 2, the relative importance weight represents preference to reopen later. COVID-19, coronavirus disease 2019.

The maximum acceptable risks for the COVID-19 risk-minimizer group are very small for improvements on the other 3 factors, because individuals with these preferences are not willing to accept COVID-19 risk regardless of when nonessential businesses are reopened, how many fewer families fall below the poverty line, or how much faster the economy recovers (Fig. 2). Since the class referred to as *waiters* preferred delaying reopening nonessential businesses, there also is no level of COVID-19 risk they would find acceptable for lifting this restriction earlier. People with these preferences, however, were willing to accept a 5.9 percentage-point increase in risk of COVID-19 to avoid a 4 percentage-point increase in households below the poverty level. This finding was similar for people with recovery-supporter and opener preferences, who were willing to accept a 4 to 5 percentage-point increase in COVID-19 risk to avoid a 4 percentage-point increase in households in poverty.

These 2 groups, however, were willing to accept higher levels of COVID-19 risk to hasten economic recovery. The people with recovery-supporter preferences would accept a 15.9 percentage-point increase in the risk of COVID to reduce the time for economic recovery by at least 1 year (from 3 years to 2 years), and the people with opener preferences would accept a 5.8 percentage-point increased risk of COVID-19 for the same gain. The factor that clearly distinguished these 2 groups was the importance they placed on reopening nonessential businesses. The people with recovery-supporter preferences gave little regard to this factor, while the openers were willing to accept COVID-19 risks above the 20% upper bound of the range shown in the choice questions. By extrapolating, individuals with these preferences would accept at least a 25% cumulative risk of COVID-19 to reopen essential businesses now rather than July and even greater risk to avoid waiting until October.

Table 2 summarizes characteristics of respondents more and less likely to belong to each latent class. The respondent characteristic most strongly associated with class membership was political affiliation (Wald score, 217; $P<.0001$). Respondents with Democratic and Republican political affiliation both were more likely to be among the risk-minimizers group, while those with

Figure 2. Maximum acceptable cumulative risk of COVID-19 by preference group. Each of the 4 figures represents COVID-19 risk levels considered important to members of each latent class as avoiding undesirable changes in other factors. For example, in the waiters class, respondents would accept an increase in the risk of COVID-19 by 5.9 percentage-points to avoid an increase in the percentage of households below the poverty line from 13% to 16% rather than from 13% to 20%. The dashed lines indicate that acceptable COVID-19–related risks for the subsequent level were greater than 25%. Note: Acceptable COVID-19 risks are negative for the waiters class, because they considered it desirable to delay reopening of nonessential businesses whereas the other 3 classes considered such delays to be undesirable. COVID-19, coronavirus disease 2019.



independent political affiliation were significantly less likely to belong in this group. Independents, however, were positively associated with being in the recovery-supporters and openers groups, and they were negatively associated with being in the waiters group. Higher income was positively associated with the people with recovery-supporters preferences and negatively associated with the waiters group. Lower-income earners were overrepresented in the waiters class, while individuals with salaries ranging from $25 000 to $100 000 were more likely to be represented in the openers class. Salaried individuals, who receive a fixed level of pay from their employer rather than pay based on the number of hours worked, were less likely to be risk minimizers or openers, but more likely to be in the waiters class. Nonwhites were strongly associated with membership in the waiters class while negatively associated with membership in the recovery-supporters and openers classes. Sex and level of education were not independently associated with class membership.

Discussion

Throughout May and June 2020, governors of all 50 states began to allow retail shops, dine-in restaurants, salons, and fitness facilities to reopen with safety precautions in place to control the spread of COVID-19. Opinion polls throughout the pandemic have cited broader support of social-distancing measures among Democrats followed by independents and Republicans.[11] A nationwide survey administered during the same period as our survey reported that two-thirds (66.3%) of respondents believed that community mitigation strategies struck "the right balance" with increasing agreement among older age groups.[12] Nevertheless, these results provide no insight about the factors respondents were considering or how they would react to specific tradeoffs in mitigation strategies. In our study, when acceptance of social-distancing measures are framed in the context of trade-offs among COVID-19 risks, longer economic downturns, and more families falling below the poverty line, we found that self-identified Democrats and Republicans actually had more similar trade-off preferences compared to those identifying as independents. This result suggests that poll respondents appear to answer simple concern or support questions ideologically (ie, Republicans are likely to say they are less concerned about COVID-19 risks and more concerned about reopening the economy than Democrats). Nevertheless, when faced with more complicated trade-off questions such as those used in choice-experiment surveys, we found that ideology plays a more complicated role in respondents' answers.

Our study, using a nationally representative sample, provides robust, conceptually sound estimates of Americans' stated willingness to accept increased risks of COVID-19 through 2020 to

Table 2. Respondent characteristics associated with each preference group.*

Less likely	More likely
Class 1: Risk-minimizers	
Independent political affiliation‡	Democrat‡
Salaried employment†	Other employment status†
	Retired or disabled†
	Republican†
Class 2: Waiters	
Independent political affiliation‡	Nonwhite‡
Income > $100 000 per year‡	Democrat‡
Retired or disabled†	Salaried employment‡
Republican†	Income < $25 000 per year‡
Class 3: Recovery-supporters	
Democrat†	Independent political affiliation†
Nonwhite†	Income > $100 000 per year†
Class 4: Openers	
Democrat‡	Independent political affiliation‡
Nonwhite‡	Income $25 000-$100 000 per year†
Income < $25 000 per year†	Self-employed†
Salaried employment†	

*Characteristics in each class listed in descending order of magnitude.
†$P<.01$.
‡$P<.001$.

hasten economic recovery and limit its impact on low-income populations. The large sample size provided ample power to characterize groups of respondents with similar preference patterns and to estimate precise relative-importance parameters. Nearly 4 in 10 respondents prioritized minimizing the risk of COVID-19, and thus were unwilling to accept any level of risk to reopen nonessential businesses or blunt the economic impact of the pandemic. About 44% of Democrats and 40% of Republicans in our sample were predicted to be in this group compared to 27% of independents.

Overall, about 1 in 4 respondents chose scenarios consistent with faster economic recovery, with class memberships of 20% of Democrats, 24% of Republicans, and 30% of independents in our sample. This group considered the differences in risk levels shown for COVID-19 to be about twice as important as differences between 2 and 5 years needed for the economy to recover.

The waiters class placing relatively little importance on minimizing the risk of COVID-19 but strongly preferring to delay reopening nonessential businesses until the fall initially appeared paradoxical. Nevertheless, this class was robust across model specifications, was relatively large, and continued to yield multiple significant covariates predictive of class membership. Low-income, non-white, Democrat, and salaried employment covariates were positively associated with class membership. Salaried individuals presumably would be less likely to suffer financially if business openings were delayed. It also is reasonable to assume that low-income individuals would have little means to spend on dine-in eating, salons, and fitness centers, thus having less interest in opening nonessential businesses. This sentiment may also be reflected in their relative disregard for the economic-recovery factor. Since they already are at or below the poverty line, economic recovery could hold little promise for them. The preference profile of this group may also be indicative of individuals hoping for a near-term effective treatment or vaccine. If such a treatment were to become available, then the projected number of COVID-19 cases would not materialize and the economy would rebound as a result. It also is possible that preferences in this group reflected trust in public-health messaging about the importance of social distancing in controlling the spread of COVID-19 rather than predictions of infection risks through the end of the calendar year. Even within a preference class, there is likely to be a diversity of beliefs and reasoning behind choice patterns.

The final group represented individuals who expressed a strong desire to open the doors to nonessential businesses immediately. Although this implies acceptance of high levels of COVID-19 risk, these individuals may have assumed that they could personally protect themselves to reduce their personal risk of COVID-19, thereby disregarding the actual risk levels shown. Interestingly, this group was not swayed by the impact on poor families, as the poverty factor was the least important. One in 5 independents (20%) in our sample was likely to belong to this class, compared to 12% of Republicans and 6% of Democrats.

Limitations

The hypothetical nature of our study is a limitation, as it is with all stated-preference studies. Nevertheless, these studies can be designed to provide insights on issues that shape public sentiment and behaviors of individuals that are isolated from their everyday reality. For instance, an individual may have strong preferences for lifting social-distancing restrictions and would be willing to assume substantial risks of contracting COVID-19. Nevertheless, they still may not be willing to violate states' stay-at-home orders. Others may give priority to restarting the economy and accept high rates of COVID-19 infection, because they personally will stay isolated to protect themselves from exposure to the virus.

Although not a limitation of stated-preference studies, respondents could have considered external information when responding to the choice questions in the survey given the nearly continuous coverage of the COVID-19 pandemic across lay and scientific media outlets. Some respondents could have considered relationships between factor levels shown in alternative profiles. For instance, some respondents may have assumed that the percentage of families dipping below the poverty threshold would be lower than shown or placed greater responsibility for economic prosperity among individuals when profiles depicted scenarios with faster economic recovery. Nevertheless, we checked for statistical interactions between COVID-19 risk and social-distancing policies and between time for economic recovery and poverty threshold variables, but these terms were not statistically significant.

We also recognize that other respondent-level characteristics, such as risk attitudes or health status, could be associated with COVID-19–related preferences, Nevertheless, we chose to limit variables included in the latent-class analysis to sociodemographic characteristics, employment status, and political affiliation—information expected to be readily available to elected and public-health officials. We typically conduct in-depth, one-on-one pretest interviews to evaluate respondents' interpretation and decision-making strategies to refine our survey instruments. For this study, we prioritized expediency. The study was not designed to investigate the motivation for the respondents' choices, but to

provide fast, actionable, policy-relevant information to decision makers in a policy crisis. Hence, we relied on the extensive experience of our study team to draft a focused survey instrument. In refining the survey instrument, we incorporated informal feedback from a convenience sample of colleagues, friends, and family members. If we had taken the time to follow standard, good-practice procedures, we almost certainly would have ended up with a different instrument. But, we would have missed a narrow window of opportunity to help inform difficult and far-reaching decisions. This study is an extreme example of what motivated and experienced researchers were able to do with no funding and very little time.

Conclusions

The number of simulation models forecasting future COVID-19 cases is proliferating as the evidence base develops on diagnostic testing, transmission efficiency, healthcare capacity, and the effectiveness of alternative social-distancing restrictions.[13-15] These models do not, however, incorporate the economic damage associated with the pandemic nor the public's willingness to accept greater infection risks to limit the economic consequences. We hope that the results of our study can support government and public health officials who must make ongoing difficult decisions about when to tighten and when to loosen social-distancing restrictions. Our findings reveal useful information about segments of the population that will be more and less supportive of various policies, findings that do not necessarily track with information reported on social media and traditional media outlets. Although highly publicized protests and opinion polls have signaled political affiliation as a strong determinant of attitudes toward social-distancing measures, when evaluating explicit trade-offs among controlling the pandemic, social-distancing restrictions, and economic recovery, we found that people's willingness to accept specific trade-offs among health and non-health outcomes is not a simple question of political ideology.

Supplemental Material

Supplementary data associated with this article can be found in the online version at https://doi.org/10.1016/j.jval.2020.07.003.

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